

94-14.

PATENT Mineral Wool.

ITS FOREMOST QUALITIES:

CHECKING TRANSMISSION OF HEAT, COLD AIR, SOUND AND
ELECTRICITY AS AN AIR-HOLDING MATERIAL, ABSO-
LUTELY FIRE-PROOF AS A MINERAL—RAT
AND VERMIN-PROOF, AND NOT AT-
TRACTING DAMPNES, BE-
CAUSE VITREOUS.

Its Manufacture, Composition and Uses in the
Construction of Dwellings, &c.

NEW YORK, MARCH, 1880.

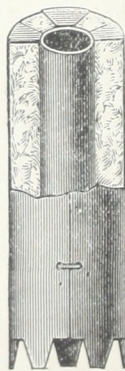
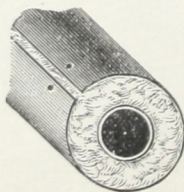
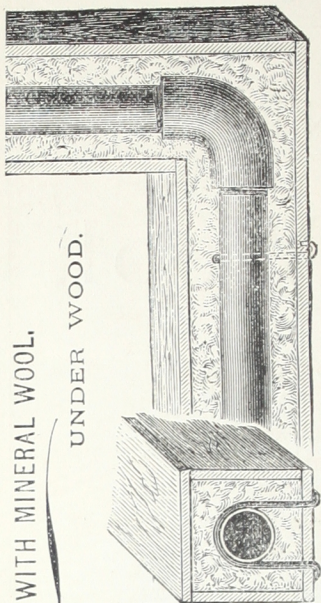
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COVERING PIPES & BOILERS WITH MINERAL WOOL.

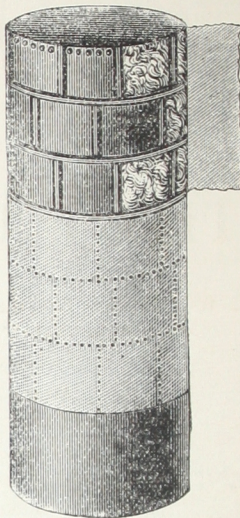
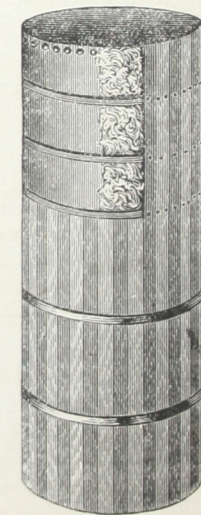
UNDER WOOD.

UNDER SHEET-METAL JACKETS.



JACKET on Boiler at the "GRAND OPERA HOUSE," N. Y.

CANVAS AND SHEET IRON COVER on Boilers of PENNA R. R. CO., on Ferry Boat "New York" (Courtlandt St.) and at Machine Shops, Meadow Station.



Strips of black walnut are screwed on transverse wooden collars 2 in. high, the wool filled between and the whole bound with brass bands.

Heavy sail duck is tacked on wooden studs 2 in. high, which form sections of about 1½ ft. square; for boilers in machine shops common burlaps are used to hold the wool, and sheet-iron jackets cover the whole.

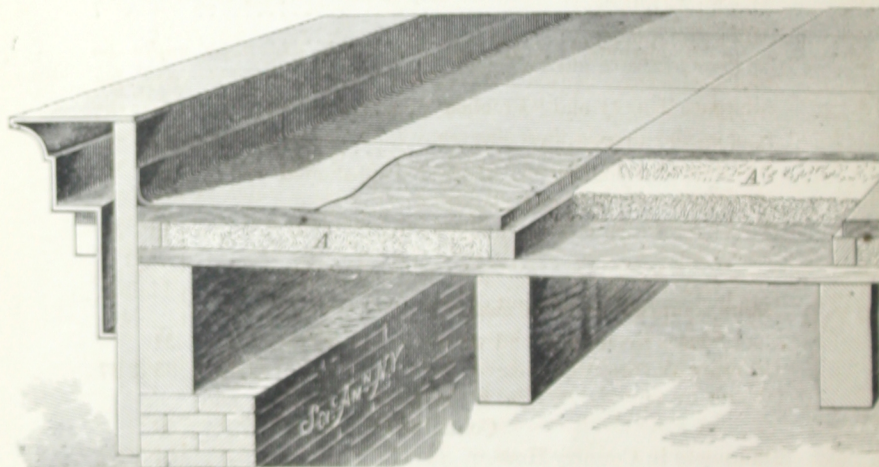
Average Working Weight of Mineral Wool per square foot :

	No. 1.	No. 2.
1 inch thickness,.....	2 1/3 lbs.	1 1/3 lbs.
1 1/2 " " " " " " " "	3 1/2 " "	2 " "
2 " " " " " " " "	4 2/3 " "	2 2/3 " "

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A. A. No. 1 MINERAL WOOL.

AVERAGE WORKING WEIGHT OF DEADENING:	In Floors and Flat Roofs.	In Upright Partitions.
Per square foot, one inch thickness	2 pounds.	2 ¹ / ₃ pounds.
Per cubic foot	24 "	28 "

In making superficial estimates of the quantity of deadening required, the deduction or allowance for timber, stairway cuttings, &c., is usually from 15 to 25 per cent.

SLAG AND SLAG WOOL.

SECTION.

1

Mineral or slag wool (also called silicate cotton in England) is made at the "iron ore smelting" or "blast furnaces" from the vitreous molten earthy refuse called "slag," while the latter is yet in a very liquid condition or nearly at white heat. Steam or air jets are so arranged as to blow with strong pressure through small streams of the slag—thereby converting the latter, as long as it flows, into a continuous spray of red hot filaments or threads, which are intermixed with unfinished or "chilled" slag particles in the form of small globules or shot.

By means of air-drafts and subdivision of the receiving chamber different grades of the wool are obtained, and the latter is pressed in bags and boxes to a consistency which will prevent its further settling when in use.

In this manner out of slag weighing about 180 pounds to the cubic foot a material is made which, as a packing or stuffing weighs according to fineness only from 6 to 30 pounds for the same volume.

It is obvious that mineral wool which, like glass, might be procured from a molten concoction of sand and other vitrifiable minerals, is only made at blast furnaces in order to utilize the heat of the already fluid slag as well as the surplus steam, which can generally be spared at such works. The cheapest grades are therefore, sold here and in Europe at a price which is not more than equivalent to the cost of separate melting and of generating steam for the blast, and all the wool made by this direct process of manipulating the slag as it flows from the furnace is of the same composition as the slag.

Slag costs nothing, but steam is expensive, therefore the cost of the wool increases with its *lightness*, the finest grade being even dearer by *volume*, than the heaviest is by *weight*.

At some furnaces where poor ores are smelted, or where a large addition of limestone or flux is necessary, up to two tons of slag are run off to every ton of pig iron, whereas in this country the output of slag and metal is of about equal weight—several million tons of slag accumulating annually.

Of this total yield at least 50,000 tons, selecting the most suitable furnaces, at which by the use of surplus steam about 10 per cent and by the adding of extra steam about 20 per cent of

2

SECTION.

the flowing slag could be converted, might be turned into wool and into a commercial value of over one million dollars annually.

- 3 **Slag consists** chiefly of silica, lime, alumina and magnesia, the identical elements of which glass is composed, and according to the preponderance of calcareous or silicious constituents is generally classified as “basic,” very limy, “neutral” and “acid,” or highly silicious.

Basic slag readily disintegrates in the open air, especially if it has cooled slowly, whereas neutral slag suddenly chilled remains already vitreous and stonelike.

Apparently a condition of vitrification which allows of converting slag into threads would be a sufficient guarantee of their “weather proof” or undecaying quality ; the finely fibrous condition or the immense surface which the wool offers to atmospheric contact under exposure, (which is not the case when it is used under lagging or encased in partition walls) allows, however, a more radical change of its particles than these could undergo if in a more compact form.

- 4 Though mineral wool from neutral slag has been exposed to rain, frost and thaw in the open air, and while imbedded in the ground for four years without material change of its fibrous condition, its ultimate disintegration into dust is a matter of certainty, quite in harmony with the final collapse of everything mundane.

But this backward concentration into its original volume will not disturb the usefulness of the wool as a covering for steam boilers or deadening under roofs, floors and behind furred walls of dwellings, &c., until *these* become also unfit for use.

- 5 At charcoal furnaces the slag flows too sluggishly for direct conversion, and at anthracite and coke furnaces it absorbs readily some sulphur gases, for which lime at high heat has great affinity, so that in the average about one per cent of the slag composition turns into sulphide of lime, whereas the rest of the composition has during the melting process formed strong chemical combinations, such as silicates of lime, &c., which are insoluble under the influences hereafter mentioned. The sulphide of lime in the wool is soluble to the extent of the latter’s surface contact with atmospheric moisture, which contains carbonic acid gas, as well as with diluted organic acids such as acetic, tannic, gallic, &c.

- 6 This decomposition, though very slow, is sufficient to cause partial calcination or “caking” of the fibres, as well as an emis-

sion of sulphuretted hydrogen gas ; the latter becoming already perceptible if the wool—in itself absolutely odorless—is rubbed between perspiring fingers.

This property may be called “antiseptic,” and does not interfere with the use of the wool in covering boilers, &c., with it, because iron has below red heat no affinity for sulphur, whereas condensed steam or water, if held in suspense by a spongy material, which is allowed to dry out gradually, will corrode metallic surfaces, which if subjected to leakage should therefore be painted or tarred before the covering is put on. The mere soaking of wool from “neutral” slag with water leaves no perceptible smell, (“acid” slag is of course less susceptible, and the *highest* vitrification or *pure glass wool* is absolutely *proof* against the aforementioned influences), so that almost any kind might be used for deadening roofs and walls of dwellings, &c.

Only the *floors* of dwellings, if to be deadened with mineral wool, should be made water-tight, or of “double-flooring,” the upper boards being tongued and grooved, otherwise soap-suds might trickle through while the floors are being scrubbed, and a noxious smell might arise, which would however also be imminent if the floor were filled with any other porous material, in which decomposition of organic matter could take place. Rotting wood, sawdust, hair-felt &c., are perhaps even more objectionable from a sanitary point of view than sulphide of lime.

Mineral wool can be made waterproof at a slight cost by coating it under heat with bituminous or resinous matter, (condensation of hydro-carbon gases), so that instead of readily *sinking* in water, it will *float* for days, if coated in this manner.

This “coating” can be made so light as to be only combustible on the very surface of the wool, when the latter is pressed for use, but of course will burn out at very high temperature.

To waterproof steampipe covering, the pipes need only be heavily tarred before the wool is put on, as the steam heat will partly vaporize the tar, which will then condense in the wool.

In mixing Mineral Wool with organic substances, for the purpose of getting a cohesive mass, a sort of felting or flexible board, it should be remembered that an admixture of say only ten per cent of either starch, paste, paper pulp, cotton, &c., will *burn out of it* at a temperature much below that at which these substances are known to ignite. This phenomenon is attributable to the attraction and absorption of atmospheric moisture by all

SECTION.

spongy organic substances, which thereby heat up, and then require but little additional heat from without to carbonize, char, or even to ignite.

- 12 **A better knowledge** of such time-honored theories would enable insurance underwriters and fire marshals to be less liberal in the usual verdict of: "Cause of the fire unknown."

- 13 **An incipient conflagration.** Odd Fellows Hall, 98 Forsyth Str., New York, caused by the ignition or spontaneous combustion of hair felt-covering on heater pipes in the basement, was checked by a partition wall filled with No. 1 Mineral wool, partition thoroughly charred on one side—wool intact—insurance saving about \$20,000 by a \$20 investment in *Mineral Wool*.

- 14 After changing slag at 180 pounds into a say ten times larger volume of mineral wool at only 18 pounds per cubic foot in the average, and thereby producing a material which on account of the innumerable air-spaces in its interstices checks the transmission of heat as much as equally fine organic substances such as loose cotton, silk, wool, &c., it must be considered unwise to reduce the wool again to a "non-conducting" cement, merely because the application of the latter to pipes and boilers is more "handy," or requires less skilled labor than that of the cooper carpenter or tinsmith, whereas the conduction of heat is increased almost in direct proportion to the *density* of minerals (not metals) and organic substances.

- 14a **The limit of greatest usefulness of mineral wool as a non-conductor**—or that condition in which sufficient air is between the fibres to prevent their too close contact, appears to be at that compactness where it will not yield any more to a light pressure of the open hand, which corresponds to the *working* weight of the different grades, as classified.

The more rapid introduction of mineral wool will materially depend on a more general knowledge of what a non-conductor really is, especially as applied in the construction of buildings:

- 14b **Slag conducts heat as much as glass—slag-wool conducts**—according to fineness—as little as cotton or sheep's-wool, because both contain so-called "dead air-spaces";—a *confined* air-chamber is however no *dead* air-space, because the action of cold winds, or of the shining sun, or the heat radiating from a stove may only act on *one* part of it—which will be sufficient to set the whole confined air in motion and thereby make this same air an

excellent conductor of heat until its equilibrium of temperature is restored.

Even small and *hermetically* confined air-chambers as in the double or hollow (one inch wide) walls of a half-pint tin can—well soldered—will let through more heat than if filled with a loose, fibrous air-holding substance; and if a single air-hole—smaller than a pin's head—is punctured into the casing of the hollow space, the conduction of heat will increase rapidly, whereas the shell around the *packed* space may be perforated all over without material effect or loss in insulation.

Passenger cars with the usual “air-space” floors may be so overheated as to cause perspiration of the head and body, while the feet feel amazingly *cold*—*Mineral Wool* floors—as in use on the *Pennsylvania Road*—are comfortable in midwinter, and save much *noise* and *fuel*. 15

PATENT MINERAL WOOL.

PRICE AND CLASSIFICATION BY WEIGHT AND MEASUREMENT.

Detailed Price-Lists and Specifications are mailed **FREE** on application.

The cheapest grade (No. 1) comes in bags, and settles by handling and jar in transportation to an *average working weight* of *twenty-eight pounds per cubic foot* for filling upright partitions, and of *twenty-four pounds* for horizontal packing, as in flat roofs, floors, etc. 16

At the wholesale factory price, one and one fourth cents per pound (in fifty to one hundred pound bags), delivered to railroad, this is equivalent to nearly *three and two and one half cents*, respectively, for *one inch thickness of packing* per square foot measurement.

The freight to New York and cartage (in lots of a ton or more) to building grounds increases this cost about ten per cent.

In *vertical partitions* where the space to be filled is over three inches in width, the working weight increases somewhat with the latter, as the friction of the wool against the partitions becomes less effective in supporting its own weight. 17

To *prevent settling*, as in the inner lining of cold-storage houses, etc., it is best to board up one or two planks at a time, not more than two feet high. Fill this space with the wool, give a few hard knocks with a hammer or mallet against these planks, then press 18

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the filling down lightly, board up another section and proceed as before.

This bagged wool is apt to break up too fine by frequent handling, and then is less convenient to stuff into narrow spaces, as under steam-pipe lagging; and, if to be shipped to distant parts, it should be sent direct from the works by the whole carload, without breaking bulk.

- 19 **The Number 2, or finer grade,** has a working weight of *fifteen to sixteen pounds per cubic foot*. It is packed in boxes, holding 4 and 6 cubic feet, therefore remains loose and “flaky”, is about one tenth more effective, and costs including package, by volume or measurement, about fifty per cent more than the bagged wool.

- 20 Both grades are well adapted for deadening floors of railway passenger-cars, etc., but neither of them should be used for lining upright spaces in *vehicles*, because the constant jar would cause too much *settling*.

- 21 **The lightest or finest wool, or the No. 3 grade.**—working weight six to eight pounds to the cubic foot,—contains only dust-like shot, and can be prepared so as to be used under locomotive jackets, etc., *without settling*.

Its price, by measurement or volume, is nearly thrice that of the bagged wool, whereas its “non conducting” capacity is, on account of the fibres being very close together, but little more than that of the No. 2 grade.

USES IN THE CONSTRUCTION OF DWELLINGS, ETC.

22. **Highly satisfactory references** *from prominent parties having actual experience with the wool in their city and country residences, for every application hereinafter described, will be furnished on application.*

- 23 **Deadening furred walls in dwellings.** Though the filling up of hollow spaces—usually four inches and more in lath and plaster partitions—is very desirable, the use of the wool for this purpose may be too costly, except for first-class houses, whereas the three fourths to one inch wide space, *between furring and brick walls* can be deadened at small cost, and with the following results:—

(1.) *The labor of furring* can be proceeded with as usual, one or two laths being left out in every foot section to allow space for stuffing the wool in. When the plaster is put on or pressed

through the laths against the wool it “keys” better, and, as the wool absorbs the surplus moisture, *dries* quicker.

(2.) *One inch of mineral wool deadening* checks the transmission of heat and cold *more than four inches* in thickness of brick, and is evidently a very comfortable addition to thin walls.

Dampness in uninhabited or closed up country houses, especially at the seaside, is the condensation of atmospheric moisture caused by the sudden cooling of the “house air”, and is prevented by well deadened walls, through which only a *gradual* exchange of temperature can take place.

(3.) **Prevention of bed-bugs**, which are literally “wood-insects”, brought to existence in wood that is slightly decaying in confined, moderately warm, and foul air,—the very conditions which obtain between furring and outer walls. The prolific generation of this vermin is well known to attentive housekeepers, who, after a rigorous scouring of “bedstead joints” and unclean recesses has failed to silence the complaint “and still they come”, frequently trace the bug’s advent to cracks in the walls.

The “vitreous” wool is neither a pleasant abode to bugs, nor accessible to rats and mice, the moisture which it may abstract from wet mortar, etc., is not sufficient to rot the furring, and its slightly antiseptic quality (sulphide of lime) prevents foulness.

Deadening floors. The wool is spread lightly, but so as to leave no empty spaces, on furring or strips between and about two inches beneath the top of the floor beams, and levelled so high as to be compressed about one quarter of an inch by the flooring, when the latter is laid down on it. The floors should be comparatively water-tight, as is the case when a finishing floor is laid crosswise over a common floor.

The wool must not be laid loosely between floors with an empty space above it, because rats and mice could pass over, while they cannot work *through* the wool, if it is compactly laid and fully encased.

Deadening roofs. The wool is packed between roofing beams in the same manner as in floors; or, if old roofs are to be deadened, it is spread between studs on the old roofing planks, and a new roofing floor is laid on top.

A two-inch layer of No. 1 wool between one-inch planks is sufficient to prevent the *direct excess of sun-heat over shade-temperature* from penetrating through the roof. In summer this excess

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amounts often to twenty-five degrees, Fahrenheit, and these twenty-five units of heat pass readily through an ordinary thin roof, through the air-space beneath it, and through the thin attic ceiling, so that *after* sunset the air beneath the roof is overheated and remains so to a late hour.

30 Ventilation or air holes right beneath the roof may give some relief during the night, but still the roof heat will pour in during the day, bear on the walls from within, as the sun does outside, and later on radiate back on the inmates of the house in spite of open windows and of cooler outside air.

31 The air in the attic under a roof which is packed or deadened as described is naturally *cooler* than that in the *lower* rooms, because farther away from the reflection and radiation of heat emanating from pavements and walls, and, in consequence, as *warm* air *ascends*, the air in the lower part of the house is impelled to circulate freely. A *warm attic* renders the *parlor* air *oppressive*, and a *cool* attic makes it *pleasant and fresh*. It is just as easy to construct houses which are cool in summer and warm in winter, as to obtain the opposite result, and in city houses which are built in rows, the *roofs* are *more* exposed to heat and cold than all the side walls together, and the roof deadening is therefore as important for *winter* as for *summer* residences.

32 **Protection of Ceilings from Leakage.** Though mineral wool is not *hygroscopic* its power of absorbing moisture corresponds with its *great air capacity*, so that a square foot of 2 inch packing can hold in suspense *several pounds* of water, which prevents the occasional drippings of rain, forced through the *tightest* roofs during equinoctial storms etc., from reaching the ceilings.

33 **The efficiency of Mineral Wool as a non-conductor is** *by weight*, say *twenty-eight pounds per cubic foot of No. 1*, equivalent to from one hundred to five hundred pounds of lath and plaster, mortar, cements, and bricks; or compared *by volume* with the lighter organic substances, one inch thickness of it is as effective as one inch hair felt, one and one fourth to one and one half inches paper, two to three inches of wood, etc.

34 **Fire-proof vaults, safes, etc.** At temperatures above one thousand degrees, Fahrenheit, the *reflection* of heat, which is the especial property of *dense* materials, but not that of a fibrous loose packing, with over eighty per cent of air volume in it, becomes a matter of great importance. The outer lining should therefore be massive stone or fire brick (or, in safes, a compact

mineral powder, holding little air), and the heat which goes through *that* will be effectually taken care of by an *inner mineral wool lining*.

Covering boilers, steam-drums, and pipes, etc. These are best encased in wood, sheet-iron, etc., with a space between for the wool, of which two and one fourth inch packing of No. 1, or two inch of No. 2, is a liberal allowance for insulating steam heat up to sixty pounds and two and one half to three inches for ninety pounds pressure, the latter thickness having also been found absolutely sufficient to insulate superheated steam at six hundred degrees, Fahrenheit, the pipes being encased in wood and in the open air.

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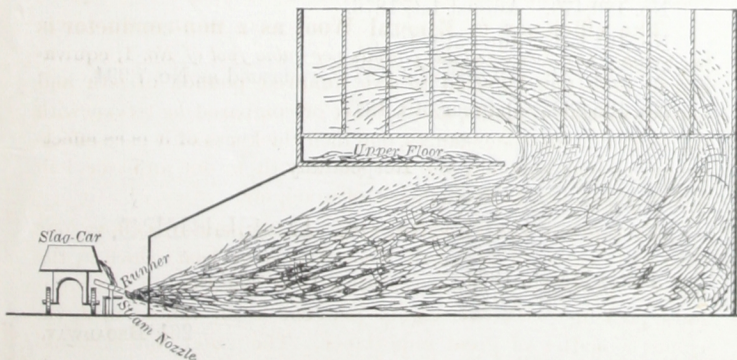
In the State Capitol, at Albany, and in Columbia College, New York, steam-pipes running several hundred feet in length, and of various size, are laid near together, and all enclosed in one cover, of thin galvanized sheet-iron, which is bent around the pipes, and held at proper distance from them by means of two and one half to three inch studs, the interstices being filled with No. 2 wool.

36

On these casings the radiation of heat is scarcely perceptible to the touch.

Protecting water-pipes against frost. The water-tank feeders, on the roofs of the Boreel and other similarly exposed Broadway buildings, are packed in two and one half to three inch thickness of No. 1 wool, encased in wood or sheet-iron; water-pipes on bridges at several large factories, water-works, and on piers, are protected the same way.

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SECTION.

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Where Mineral Wool is made. The primary introduction of a new material, the manifold applications of which have only been gradually developed, is naturally of slow growth, and during the past four years the demand was frequently not even adequate to the capacity of the *One Works*, at which it has been so far manufactured in this country, viz : by **R. D. A. Parrott, at the Greenwood Iron Works, (Eric Railway,) Orange Co., N. Y.**

After sales of over \$30,000, representing a quantity of nearly two million pounds of Mineral Wool of all grades, applied to all the various uses herein described, the demand is now up to the *utmost capacity* of the works above mentioned, and promises to require soon the active cooperation of other iron makers in various sections of the country.

39

Slag and Slag Wool. (Extracts from U. S. and English Patents.)

Under this heading a concise history of the origin of the Mineral Wool Industry and of the inventions relating thereto, will be found in the issue of *February 27th*, 1880, of the "*American Manufacturer and Iron World*," published by the National Iron and Steel Publishing Co., Pittsburgh, Pa."

Manufacturers, Importers, Venders and Consumers are cautioned against infringement of the following U. S. Patents :

No. 103,650. May 31st, 1870. Reissued in two divisions:
No. 6,894. February 1st, 1876.
No. 6,895. " " "
No. 180,470. August 1st, 1876.
No. 191,524. June 5th, 1877.
No. 194,422. August 21st, 1877—re-issued as No. 7,994.
No. 195,889. October 9th, 1877.

Respectfully,

A. D. ELBERS,

NEW YORK, March, 1880.

General Agent,

26½ BROADWAY.

Address, P. O. Box 4461.

Where Mineral Wool is used.

PACKING ROOFS, FLOORS AND PARTITION WALLS OF PRIVATE RESIDENCES, &c.

40

5 floors (44,000lb No. 1), 3 in. deadening.....No. 374 Fifth Ave., New York.
Roof and floors, 2 in. deadening.....155 West 14th Street, “
Hygienic Institute..... Dansville, N. Y.

“We have tried the experiment suggested in a recent number, of using this material for filling walls, both those already built and those in process of construction, for the purpose of securing warmth in winter, and it works admirably.”

“We esteem the substance so highly that we remind our readers of the address, &c.”

“It pays in more ways than one to be comfortable.”

From the “*Laws of Life*,” February 1880.

Further highly satisfactory references from prominent residents in the city, suburbs and from leading architects and builders will be furnished on application.

Especial attention is called to the construction of *Frame Dwellings* with Mineral Wool packed between the outside walls and an inside *hard wood finish* instead of *lath and plaster*.

BREWERY ICE-HOUSES lined with No. 1 Wool.

ALBERT ZIEGELE, 215,000 lbs.....Buffalo, N. Y.
C. MOERLEIN, 176,000 lbs.....Cincinnati, O.
KERR & SMITH, 112,000 lbs.....143 West 18th St., New York.
Also, MESSRS. G. KRUEGER, FEIGENSPAN & Co., Newark, N. J.; HENZLER and FLACH, G. MANZ, F. A. POTH, Philadelphia, Pa.; GEO. BAUERNSCHMIDT, Baltimore, Md.; ROBT. PORTNER, Alexandria, Va.; BARTHOLOMAEW BREWING Co., Rochester, N. Y.; TOLEDO BREWING Co. (P. LENK) Toledo, O. &c.

Cold Storage.

W. H. SILBERHORN & Bros., Packers and Provision Dealers, (33,000 lbs No. 1) 90 Chrystie St., N. Y., FRENCH & Co., Poultry, Game, &c., 180 Reade St., N. Y., P. LENK & Co., Toledo Beer Depot, 11 Barclay St., N. Y., F. HOLLENDER, Tryon Row and Corner Chambers Street & Broadway, N. Y.; ROCHESTER BREWING Co. and COMPRESS BOTTLING Co., 49 West Broadway, N. Y.

COVERING BOILERS, STEAM DRUMS, TANKS, WATER-PIPES, &c.

COLUMBIA COLLEGE, 500 cubic feet No. 2.....N. Y.
STATE CAPITOL, 400 cubic feet No. 2.....Albany, N. Y.

Chemical Works, &c.

CHURCH & Co., all grades in use since 1876.....Brooklyn, N. Y.
GEO. M. MOWBRAY, do doNorth Adams, Mass.
BATTLE & RENWICK.....New York and Jersey City.
DAVENPORT GLUCOSE M'f'g Co., 12,500 lbs. No. 1.....Davenport, Iowa.

Cotton Print and Woolen Mills, &c.

MERRIMACK M'f'g Co. AND PRINT WORKS, over 16,000 lbs. of all grades, in use since 1876, Lowell, Mass.; COCHECO M'f'g Co., (over 800 cubic feet of No. 2), Dover, N. H.; APPLETON Co., HADLEY Co., GILMANTON, MIDDLESEX, HAMILTON, &c.

Gas Light Companies.

KNICKERBOCKER GAS LIGHT Co., (41,500 lbs. No. 1), N. Y.; SIOUX CITY GAS LIGHT Co., Sioux City, Iowa; ELYRIA GAS AND WATER Co., (10,000 lbs.), Elyria, Ohio; CITY GAS Co., London, Ont.; GAS LIGHT AND COKE Co., Cincinnati, Ohio.

Iron Works and Blast Furnaces.

CAMBERIA IRON Co., (over 20,000 lbs. of No. 1 and 2), Johnstown, Pa.; GLENDON IRON Co., Easton, Pa.; CLOVE FURNACE, Orange Co., N. Y.; ONTARIO FURNACE, Wayne Co., N. Y.; MERION FURNACE, Conshohocken, Pa.; KEMBLE COAL & IRON Co., Riddlesburgh, Pa.; STERLING IRON & RAILWAY Co., Sterling Junction, N. Y.; JEFFERSON IRON Co., Antwerp, N. Y.

Mines.

BASSICK MINING Co.....Rosita, Col.
COXE BROS. & Co.....Drifton, Pa.
PARROTT MINE.....Warwick, N. Y.
U. P. COAL DEPARTMENT.....Rock Spring, Wy. T.

Miscellaneous.

W. D. McLAREN, 55 College Place, Montreal, Can.; DOMINION OIL CLOTH Co., Montreal, Can.; H. McLAUGHLIN, Bangor, Me.; GOLD MEDAL SEWING MACHINE Co., Orange, Mass.; COLLINS Co., Collinsville, Ct.; GREENWOODS Co., New Hartford, Ct.; ANTHRACITE FUEL Co., Rondout, N. Y.; W. A. GAINES & Co., Frankfort, Ky.; BREMAKER-MOORE PAPER Co., Louisville, Ky.; PEPPER COTTON PRESS, St. Louis, Mo.; MERIAM & MORGAN PARAFFINE Co., Ohio; DIEBOLD SAFE & LOCK Co., Canton, Ohio; SEYMOUR, SABIN & Co., Stillwater, Minn.; W. H. BUTLER, (Safes), New York; SCHROEDER & BON, (Tobacco Sweating Rooms), New York; C. F. A. HINRICHS, (Lamp Wicks), New York.

Oil Works.

J. A. BOSTWICK, (14,000 lbs. No. 1 and 2).....Hunters Point, N. Y.
E. E. HENDRICK.....Carbondale, Pa.
ECLIPSE LUBRICATING OIL Co.....Franklin, Pa.
VACUUM OIL Co.....Rochester, N. Y.

Railroad Companies.

PENNSYLVANIA R. R. Co. Over 200,000 lbs. No. 1, for deadening floors of Passenger cars; all grades for boilers in Steamships, Ferryboats, in machine shops and for cold water-pipes on piers, at New York, Jersey City, Meadow Station, Camden, Philadelphia and Altoona.

Steam Engine Builders, Foundries, &c.

HERRESHOFF M'FG Co.....Bristol, R. I.
WM. WRIGHT.....Newburgh, N. Y.
H. P. GREGORY & Co.....San Francisco, Cal.

Stove Works.

CHICAGO & ERIE STOVE Co., Limited.....Erie, Pa.
CLEVELAND CO-OPERATIVE STOVE Co.....Cleveland, Ohio.
WM. RESOR & Co.....Cincinnati, Ohio.

Water Works.

ATTICA WATER Co.....Attica, N. Y.
BELVIDERE WATER Co.....Belvidere, N. J.
ST. LOUIS WATER WORKS, 35,000 lbs. No. 1.....St. Louis, Mo.